NAEB Engineering Newsletter
NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS
14 Gregory Hall Urbana, Illinois Phone 7-6611, Ext. 3394

NAEB ENGINEERING NEWSLETTER NO. 8

January 1957

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This is the first issue of the Engineering Newsletter for 1957 and the last one in this mimeographed format. Beginning with the January 1957 issue, the regular NAEB Newsletter is to be printed. This may help us to get these quarterly issues out more promptly, at least we hope so. In the printed version too, we shall be able to use photographs and line drawings which will enable us to illustrate articles more easily.

We have in preparation a paper on a two channel all transistor remote mixer-amplifier, designed and built by Donald K. Haahr of the staff of WOI at Iowa State College. This will be mailed to you separately since it will probably not be ready to go with this Newsletter. We also have in preparation a paper by E. D. Goodale of the National Broadcasting Company on phase, amplitude and aperture correction in television systems. This will be sent only to ETV stations and studios and to others upon request.

Work has been started on the revised Technical Directory. Many failed to return the forms sent to our mailing list on November 26. We don't want to leave anyone out so we're including these forms as the last page of this Newsletter. Please fill out both sides of this page as we need both directory data and test equipment information. Thanks.

Cecil S. Bidlack
January 9, 1957

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PHASE, AMPLITUDE and APERTURE CORRECTION IN TELEVISION SYSTEMS *

by
E. D. Goodale
National Broadcasting Company

If there has been some phase distortion in a system caused by a curvature of the overall phase characteristic away from the frequency axis, then the output pulse will have an overshoot on the edges after the transition. The slope of the phase curve or the time of transmission of the various frequency components of the signal gets greater as the frequency increases. This results in a dissymmetry about an abrupt transition which contains high-frequency components. If the overall phase characteristic of the system has curvature towards the frequency axis, then the output pulse will have an undershoot, sometimes called an anticipatory transient before the transition. The slope of the phase curve or the time of transmission of the various frequency components of the signal gets smaller as the frequency increases. This likewise results in a dissymmetry about an abrupt transition but on opposite corners of the pulse. It is these dissymmetries about an abrupt transition that indicate the presence of phase distortion and give a clue to the nature of the correction required to compensate for it.

Ideally, an "Amplitude Booster" without phase shift is required for aperture correction. Such a practical circuit is shown. It comprises a phase correcting section and a couple of cathode peaked amplifier stages. The overall amplitude and square-wave responses of such a circuit are shown in Figure 1. Curve A shows the normal response of the unit with no boosting action. Curves B, C, and D are the responses for different amounts of high frequency rise. The accompanying effects on a pulse are shown in the photographs with the corresponding letters. These response measurements were made after adjusting the phase controls to give a reasonable symmetrical transition to the edges of a 100 kc square-wave pulse having a rise time of approximately .10 micro-second. It should be carefully noted that in this case there are approximately equal under shoots and over shoots on an abrupt transition. Exact symmetry would indicate a linear overall phase characteristic for the corrector. If the incoming signal has a loss of high frequency detail without phase shift, which is the theoretical result of scanning with a finite spot size, then these units should restore a part of such loss and improve fine detail contrast.

*This is a resume of a paper delivered in April 1952 before the Cincinnati Section of the Institute of Radio Engineers by Mr. Goodale, Manager of Engineering Development at NBC. It is being duplicated with his permission. The resume was prepared by Keith K. Ketcham, Chief Engineer, WOI-AM-FM-TV at Ames, Iowa.

It should be noted that on the schematic shown there are three controls. One of these is labled Ph-R, a second Ph-C and the third Amplitude Control. The first two are phase adjustments and are separated from the third which changes the amount of amplitude boost. For each step of the amplitude control the approximately correct values of Ph-R and Ph-C are simultaneously connected into the phase corrector part of the circuit so that the unit has a reasonable linear overall phase characteristic. This leaves the variable Ph-R and Ph-C controls for adding additional phase correction of the type to produce an anticipatory transient if needed.

To facilitate making system amplitude response measurements, including all components of a system as they are normally used in operation, an adapter or coupling unit such as shown in Figure 2 was designed and built to simulate the image orthicon output. It is simply a 1T4 tube having a flash-light cell for a heater supply mounted on an old image orthicon tube base. In use, the unit is plugged into the socket in the camera in place of the pickup tube and a test signal applied to its grid. The plate of the 1T4 is connected to pin #7 of the base and thus has the identical impedance which the pickup tube uses including all stray capacities due to wiring, etc. The plate to ground capacitance of the 1T4 has to be increased by approximately 5uuf in order to make it similar to an image orthicon multiplier output. A Q-meter is used to measure the total grid-to-ground capacity of the first tube in the camera when the image orthicon is in place and then when the simulating unit is connected. The plate-to-ground capacitance of the 1T4 is increased by the difference between the two measurements in order that the high frequency loading effect will be the same in either case. When using the simulating unit, with an RCA television camera, the 1B3 high voltage rectifier tube is removed from its socket and the bottom side of the 100K ohm isolating resistor in the image orthicon output load circuit which normally supplied with +1300 V. by the 1B3, is connected to the +285 V. with a short jumper. Screen voltage for the 1T4 is picked up on pin #10 in the image orthicon socket.

A frequency run made through a chain of equipment in this manner includes the effect of the RC roll off in the grid circuit of V-2 and its compensation in the grid circuit of V-4 of the camera. Before making such a measurement the chain of equipment should be lined up with a good pickup tube in place and the so-called "hi-peaker" adjustment in the grid circuit of V-4 set for minimum smear or streaking. The input signal level to the 1T4 should be padded down until the video level on the cable connected to the camera output is approximately .25 volts peak to peak with the camera gain control set at mid-position.

A composite signal is advisable, such as a multi-burst frequency, a sweep or a window, which might be available from a network standby feed, or generated on a film chain.

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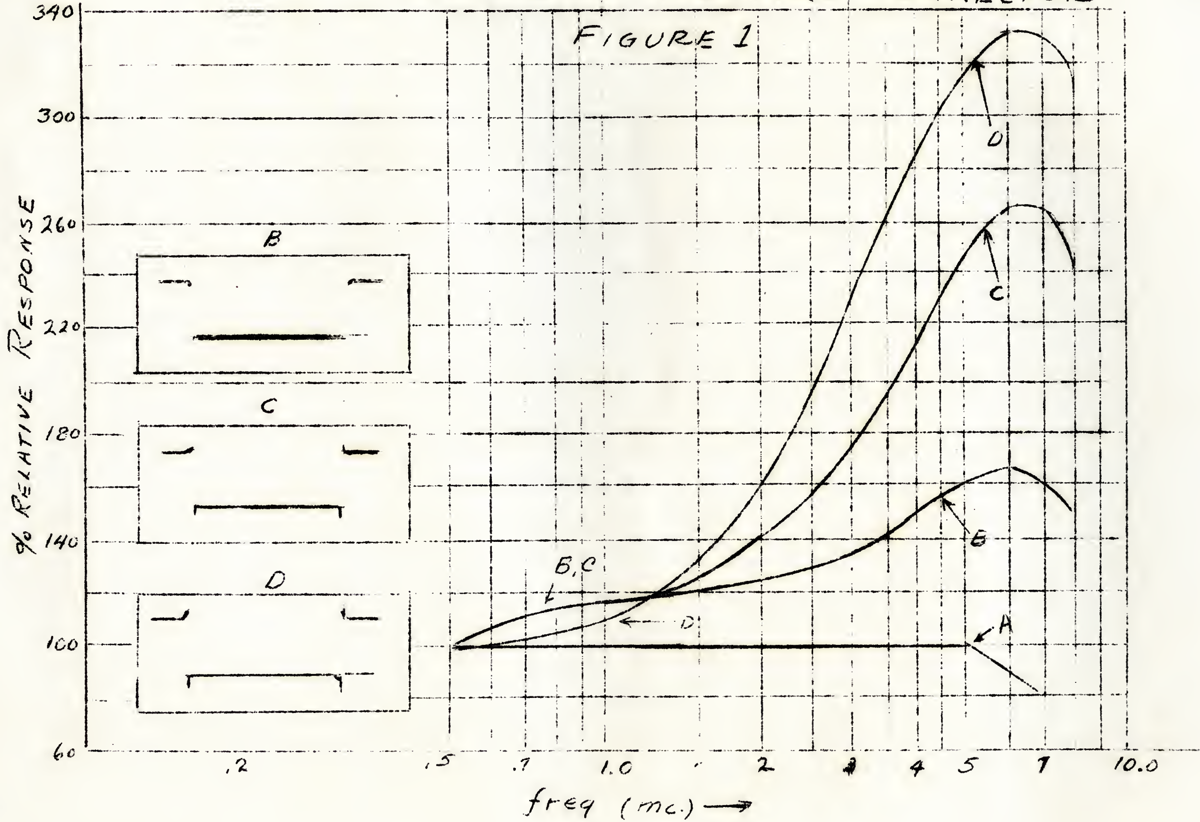
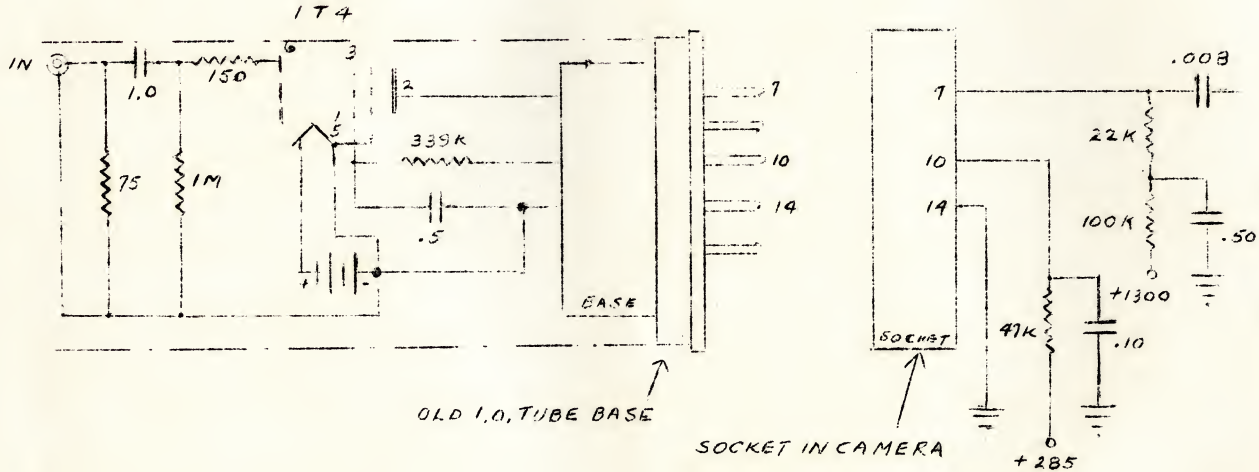
RESPONSE OF APERTURE CORRECTOR

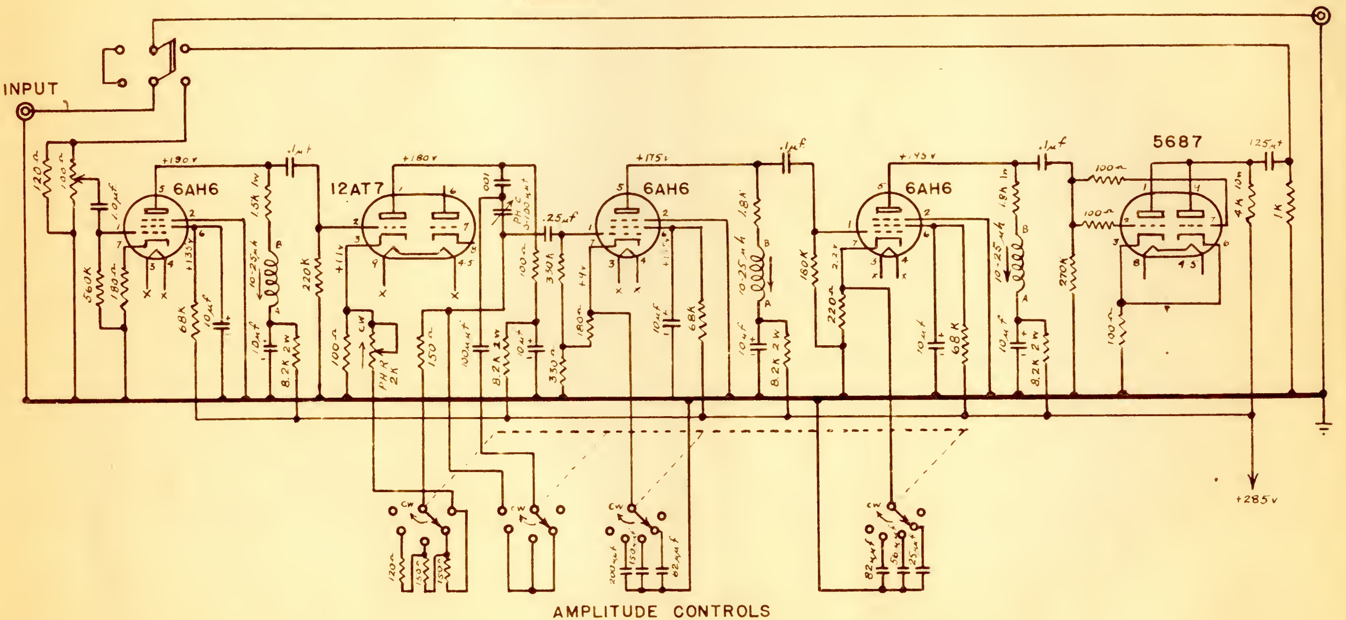




1T4
IN
1,0
150
75
1M
3
2
5
339K
.5
BASE
7
10
14
OLD I.O. TUBE BASE
SOCKET
SOCKET IN CAMERA
.008
22K
100K
.50
+1300
47K
.10
+285

FIGURE 2

PHASE AND APERTURE CORRECTOR



NBC-E.D.GOODALE
REVISED- WOI-TV
10-10-56 D.K.H.